ENVIRONMENTAL STEWARDSHIP PLAN: EXETER SPORTSMAN'S CLUB OUTDOOR SHOOTING RANGES

Prepared for

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1.0 INTRODUCTION

Exeter Sportsman's Club (ESC) operates a rifle/pistol range and a trap range, supported by a clubhouse, auxiliary buildings, access road, and parking area off Portsmouth Avenue in Exeter, New Hampshire.

This Environmental Stewardship Plan (ESP) specifically addresses environmental management of materials associated with firearms shooting at the ESC outdoor shooting ranges. It describes the environmental setting and conditions for the shooting areas and presents plans for ongoing environmental stewardship of those areas. This ESP is consistent with, and describes implementation at ESC of, the guidance and recommendations of the United States Environmental Protection Agency (EPA 2001) and the National Shooting Sports Foundation (NSSF 1997). This ESP does not include the following topics, among others, which are addressed elsewhere:

- environmental concerns that may be associated with non-shooting materials, activities, or facilities
- Occupational Safety and Health Administration (OSHA) issues for employees
- health and safety issues for shooters, spectators, and other non-employees
- sound
- obtaining and complying with any environmental or other permits that may be required for implementation of the ESP

The initial ESP was developed pro-actively on the initiative of Exeter Sportsman's Club through a contract with Dick Peddicord & Company, Inc.[1] in April 2011. The expectation is that ESC management will review the ESP periodically and revise it as appropriate based on implementation experience. All revisions of the ESP are the responsibility of Exeter Sportsman's Club; Dick Peddicord & Company, Inc. assumes no responsibility for the nature or consequences of any revisions or lack thereof.

1.1 PURPOSE OF THIS ENVIRONMENTAL STEWARDSHIP PLAN

This ESP is specific to the environmental conditions that exist at the Exeter Sportsman's Club ranges and the shooting activities conducted there. The purposes of this ESP are to:

- Document the present environmental setting
- Identify issues of potential environmental concern that may exist

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- Identify, evaluate, and prioritize appropriate actions to manage these issues
- Identify short- and long-term management action items and the steps needed for implementation
- Develop an implementation schedule
- Provide for periodic evaluation of progress toward environmental stewardship goals and appropriate revisions of plans
- Identify ways to measure and document results of management actions

1.2 GOALS OF THIS ENVIRONMENTAL STEWARDSHIP PLAN

1. Limit the future distribution of shooting-associated materials to the ESC leasehold
2. Avoid shooting over or into water or wetlands
3. Periodically reclaim and recycle lead
4. Prevent shooting-associated materials on the ESC leasehold from migrating off the leasehold through surface water and groundwater
5. Discourage ingestion of shot by birds
6. Optimize management of rifle/pistol cartridge cases and shotgun hulls, wads, and clay targets
7. Maintain this ESP as an up-to-date "living" document

2.0 SITE ASSESSMENT

2.1 GENERAL ENVIRONMENTAL BEHAVIOR OF SHOOTING-ASSOCIATED MATERIALS

2.1.1. Bullets

Most bullets used at outdoor rifle and pistol ranges are lead, although other bullet materials (e.g., copper) are used to some extent in jackets and solid bullet construction, especially frangible copper bullets sometimes used in law enforcement training. Lead bullets also contain other metals that may be of environmental relevance at outdoor ranges under certain conditions:

Centerfire rifle, pistol & revolver projectiles (Remington 1995a)	
Constituent	**Percent**
Lead	14 - 79
Copper	16 - 82
Zinc	6 - 28
Antimony	0.1 - 2
Arsenic	<0.5

Backstops and floors of outdoor rifle/pistol ranges contain intact bullets of the various sizes and types that have been fired on the range. Backstops also contain bullet fragments of various sizes and shapes produced when incoming bullets strike pebbles or other bullets in the backstops. These bullet fragments can be tiny, even microscopic, and include all shapes from roughly spherical to flattened flakes. Bullets and bullet fragments undergo continuous slow "weathering" that produces various compounds (e.g., oxides, carbonates) with the metals in the bullets. Weathering rates vary greatly depending on site-specific conditions. The weathering products occur on the surfaces of bullets and bullet fragments, from which they are abraded by rain, wind, freeze/thaw, and other physical forces at rates that vary greatly depending on site-specific conditions, and then exist as microscopic particles of metal compounds in the soil of the backstops and range floors. Even though bullets and bullet fragments are approximately five times as dense as soil and sand, small bullet fragments (particularly flattened "flakes") can be transported by surface runoff under some site-specific conditions. Microscopic particles of weathered metal compounds are somewhat less dense than bullet fragments, although considerably more dense than soil, and can be transported by surface runoff.

2.1.2 Shot

The lead shot commonly used in trap shooting contains metals other than lead that may be of environmental relevance at outdoor ranges under certain conditions (Remington 1995b):

Lead shot	
Constituent	**Percent**
Lead	50 - 92
Copper*	8 - 65
Antimony	0.1 - 5.5
Arsenic	0.3 - 1.4

* Copper is contained in copper-plated shot that is intended for special purposes; it has not been, and will not be, used at ESC.

Depending on site-specific conditions, shot undergoes continuous slow "weathering" that produces various compounds (e.g., oxides, carbonates, sulfates) with the metals in the shot. These weathering products occur on the surfaces of shot, from which they can be abraded by rain and other physical forces and then exist as microscopic particles of metal compounds in the soil of the shotfall zone. Lead shot is approximately five times as dense as soil and sand due to its composition, and tends resist transport by surface runoff. Microscopic particles of metal compounds weathered from shot are somewhat less dense than shot, although still several times

as dense as soil particles, and can be transported by surface runoff under some site-specific conditions.

Throughout this document, bullets, shot and metal compounds weathered from bullets or shot are collectively referred to as lead particles, recognizing that these particles vary considerably in size and contain small amounts of compounds of various metals in addition to lead. The Actions in Section 3.2 are specifically designed to manage various aspects of the environmental behavior and potential impacts of lead and the other metals associated with bullets and shot consistent with EPA (2001) and NHDES (2000) guidance.

Non-toxic (steel or bismuth) shot has been used exclusively on the ESC trap range since 1987. There is a deep and widespread lack of shooter acceptance of these shot materials for clay target shooting due to a complex interaction of many factors related to performance, damage to shotguns (especially heirlooms), safety from ricochets, tradition, cost, lack of demonstrated (in contrast to presumed) environmental acceptability, and other factors. Therefore, ESC developed this ESP to provide for environmentally sound management of lead shot consistent with EPA (2001) and NHDES (2000) guidance, and plans to resume use of lead shot as the ESP is implemented. Prudent management includes Action 6 (Section 3.2) to remain current on advances in the performance, shooter acceptance, competitive standing, and environmental characteristics of shot other than lead, and re-evaluate its use as warranted.

2.1.3 Clay Targets

The clay targets used on the ESC trap range consist of approximately 2/3 powdered limestone and 1/3 asphalt pitch binder (Remington 1994). The pitch contains a class of organic compounds known as polycyclic aromatic hydrocarbons (PAH) that in general are stable in the environment, have low volatilities, have very low solubilities in water, and are not taken up by plants. In addition, they are so tightly bound within the target matrix that they are almost inert biologically, leach extremely slightly, and are very stable and essentially inactive in the environment (Baer *et al.* 1995). Asphalt pitch clay target fragments have not been shown to be major environmental concerns at shooting ranges, and a thorough environmental risk assessment at a trap and skeet range in the northeast (Peddicord & LaKind 2000) showed them to pose no ecological or human health risks. The same PAH compounds are found in asphalt pitch in all the applications for which it is used.

Even though the materials in asphalt pitch clay targets are essentially inactive in the environment, very small target fragments may be visually undetectable in soil. Experience has shown that many very small target fragments occur on and in surficial soil wherever asphalt pitch target debris is visible, and that in such situations extraordinary care and effort is required to collect soil samples free of small, visually indiscernible target fragments. If soil samples containing visually indiscernible asphalt pitch target fragments are analyzed for PAH, the small target fragments can give the samples an incorrect chemical appearance of being contaminated with PAH when, in fact, the PAH are tightly bound in the target matrix, essentially inactive in the environment, and little cause for concern. Asphalt pitch clay target fragments contribute nothing positive to the environment and can be viewed as litter, especially if washed off the range property.

2.1.4 Wads and Hulls

Wads (Remington 2001a) and hulls (Remington 2001b) are made of polyethylene, the same plastic as milk cartons. Wads and hulls have not been shown to be environmental concerns at clay target ranges. However, they contribute nothing positive to the environment and can be viewed as litter, especially if washed or blown off the range property.

2.2 ONGOING ENVIRONMENTAL ACTIVITIES

Exeter Sportsman's Club developed this ESP as part of its implementation of the EPA (2001) and NHDES (2000) guidance on management of lead at outdoor shooting ranges. In addition to development of this ESP, supporting environmentally-related ESC activities include:

-NH Hunter Education instruction
-Annual Fishing Derby in May hosting area children
-NRA-credentialed and other firearms safety and reloading instruction
-Exeter Police Department qualification and training
-Federal Flight Deck Officer (armed airline pilots) training
-Partnering with Boy Scouts of America (BSA) on merit badge completion
-Prospective partnering with BSA Venturing program
-Plan to landscape with additional trees and bushes
-Solar powered street sign lighting
-Providing wildlife habitat

2.3 DESCRIPTION OF SHOOTING RANGES

The ESC facilities are located on Waterworks Pond Road off Portsmouth Avenue in Exeter, NH. The rifle/pistol range is located on the northwestern portion of the property to the north of the trap range. The property is bounded on the west by the Exeter Water Filtration Plant, on the north by the OSRAM-Sylvania manufacturing facility, and on the east by undeveloped private property. The property fronts on a portion of the north shore of Exeter Reservoir, which is an impoundment of Dearborn Brook that runs into the Squamscott River in the Town of Exeter. The property is gently rolling topography sloping generally southward. A stand of mature second-growth mixed hardwoods and conifers on the property blends into a regrowth of smaller, similar trees typical of the region on the private property to the east. Surface runoff from much of the property is into an ephemeral "stream" that enters the reservoir. There appears to be no permanent surface water or wetlands on the ESC property other than the edge of the reservoir.

The current 100-yard rifle/pistol range has been in use since approximately 1955. The range has four shooting lanes with covered firing lines at 25, 50, and 100 yards from target holders a short distance in front of the earthen backstop approximately 15 feet high. The shelter covering the 100-yard firing line has been in existence since approximately 1980, with a significant frontal section being added in 2010. The 25- and 50-yard line shelters were constructed in 2010. All three shelters conform to industry standards for sound and bullet containment. Bullet containment is effected by a system of "baffles" constructed of 2x12" lumber according to

industry standards. A side berm to the northwest of the rifle/pistol range was significantly extended in 2009 to meet lease requirements.

The trap range consists of one trap range that shoots northeastward. Shooting began on this field about 1957. In 1987, ESC on its own initiative suspended trap shooting with lead shot and additionally limited shooting on the trap range to positions 3, 4, and 5 (i.e., no shooting toward the trees to the south of the field). The purpose was to prevent lead shot from falling into the ephemeral stream and to minimize any potential for lead to enter the reservoir. These actions assured that lead shot could not fall into the reservoir, but resulted in shooting that only partially resembled standard trap shooting. As a result, since that time there has been little trap shooting at ESC, and that has used non-toxic (steel or bismuth) shot exclusively. Because ESC has historically been primarily a trap club and many members prefer trap shooting, ESC developed this ESP to provide for environmentally sound management of lead shot consistent with EPA (2001) guidance, and plans to resume use of lead shot as the ESP is implemented. ESC thinks that since it implemented the changes in trap shooting in 1987, the Town Water Department has frequently tested the water at the mouth of the ephemeral stream and not found elevated lead concentrations, even though lead shot from over 25 years of trap shooting remains on the ground.

There is no written record of lead reclamation and recycling from either the rifle/pistol or the trap range in the past.

As far as the ESC knows, there are no wells on the leasehold or nearby, except for the six test wells drilled by the Town in 2004 and periodically monitored by the Town. ESC understands that as of August 2010, the Town's testing of water from these wells had shown no increase in lead or other contaminants over the five or six years of the wells' existence.

The following characteristics of near-surface soil at the site are summarized from databases of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS 2008).

Soil Characteristic	NRCS Description
Soil type	Soil type 38B (Eldridge fine sandy loam).
Percent clay content	Soil contains 3 percent clay. According to EPA (2001) and NSSF (1997), clay tends to sorb lead and other metals from solution and bind it in the soil, thus reducing potential for surface and groundwater contamination. The clay content of all the ESC range soils is sufficient to exert this effect to a moderate extent.
Acidity (pH)	Soil pH 6.2. EPA (2001) and NSSF (1997) state that when soil pH is between 6.5 and 8.5 the potential is minimal for movement of dissolved metals into surface water or groundwater. When range soil pH is below 6.5, EPA and NSSF recommend that agricultural lime be added to the soil to adjust the soil pH into the desired range to minimize the potential for metals to dissolve. Even though site soil is only very slightly below the recommended range, this EPA recommendation is implemented in Section 3.2 of this ESP. The resulting soil pH will compliment other soil characteristics and management Actions, and together protect surface water and groundwater to a great extent.
Depth to restrictive soil	Over 6.5 feet for ESC ranges. A restrictive layer is a nearly continuous layer that has one or more physical or chemical properties that substantially impede the movement of

layer	water through the soil, such as bedrock, cemented layers, dense layers, etc. Precipitation will tend toward infiltration preferentially over runoff, thus protecting groundwater to a great extent.
Hydrologic soil group	Group C. Hydrologic soil groups indicate runoff potential based on the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. Group C soils have a slow infiltration rate and a slow rate of water transmission when thoroughly wet. They consist chiefly of soils having a layer that impedes the downward movement of water, or soils of moderately fine or fine texture. The slow infiltration and water transmission rates of ESC range soils are a good compliment to other soil characteristics and management Actions, and together protect groundwater.
Drainage classification	Soil of ESC ranges is classified as moderately well drained. Drainage class refers to the frequency and duration of wet periods and subsequent drainage of the soil. Seven classes of natural soil drainage are recognized-excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. The moderately well drained nature of ESC range soil tends to minimize the contact of lead with water, thus protecting surface runoff and groundwater by minimizing the potential for lead shot to dissolve.
Septic tank absorption field suitability	Very limited due to flooding, shallow depth to a saturated zone in the soil, and slow water movement through the soil. Septic tank absorption field suitability is relevant to shooting range soils as it indicates the potential for water to absorb into the soil rather than run off. The rating of "very limited" on the shotfall zone is due to the shallow depth to a water-saturated zone in the soil, which is also unfavorable because of potential movement of lead that may dissolve from shot. However, this tends to be somewhat offset by the slow rate of water movement through the soil, which tends to favorable restrict movement of any dissolved lead, even though this slow movement would be unfavorable for dispersion of septic tang effluent. The ratings of "somewhat limited" and "very limited" due to shallow depth to bedrock, though unfavorable for septic tanks, tend to be very positive for ranges. The shallow bedrock restricts water from infiltrating into the ground. Any tendency to reduce infiltration tends to protect groundwater from the potential for contamination, which compliments other soil characteristics and management Actions to protect groundwater to a great extent.
Flooding frequency class	None on ESC ranges. Flooding is the temporary inundation of an area caused by overflowing streams or runoff from adjacent areas. Water standing for short periods after rainfall is not considered flooding. The flooding frequency of "none" is very positive because it indicates floodwater is very unlikely to cover areas where lead is present, thus minimizing the potential for dissolved or particulate lead to be carried into water. This will compliment other soil characteristics and management Actions, and together protect surface water and groundwater from lead to a great extent.
Ponding frequency class	None on ESC ranges. Ponding is standing water in a closed depression from which it is removed only by deep percolation, transpiration, evaporation, or a combination of these processes. Ponding frequency of "none" means that ponding is not probable, and the chance of ponding is nearly 0 percent in any year. The "none" rating is very positive for the range; it indicates there is little potential for water to collect and stand where lead is present, thus minimizing the potential for lead to dissolve and enter surface water or groundwater. This will compliment other soil characteristics and management Actions, and together protect surface water and groundwater to a great extent.

The naturally occurring soil characteristics on the ESC ranges summarized above are such that they work together and in conjunction with the management Actions of Section 3.2 to minimize the potential for chemical or physical mobility of dissolved or particulate lead, maximizing control and management and minimizing potential for environmental effect.

The following paragraphs summarize environmental studies at the site, which should be consulted for details.

Camp Dresser & McKee, Inc. conducted a Phase II environmental assessment of the ranges for the Town of Exeter (CDM 2003). The study described the distribution of lead and other shooting-associated constituents from the rifle/pistol range and trap range. Elevated lead was found at both ranges horizontally and in the top foot of soil. Water in five shallow wells installed approximately 6 feet deep around the site showed dissolved lead below the analytical detection limit of 12 micrograms per liter (ug/L or parts per billion-ppb), even after approximately 50 years of shooting at the site. These monitoring wells remain in place. Three surface water samples collected from Exeter reservoir along the property shoreline had lead concentrations below the analytical detection limit of 5 ug/L.

URS (2006) conducted additional characterization of the ESC ranges and adjacent areas. The study indicated that "surface water and groundwater have not been significantly impacted by gun range activities", after shooting at the ESC ranges for approximately 50 years. URS (2006) confirmed elevated total lead in soil on and beyond the property owned by the Town, and in the soil/sediment of the ephemeral stream. URS removed lead-containing soil from the bottom of the ephemeral stream, and incorporated this soil into the north side berm of the Rifle/Pistol range. URS also created a number of low "dams and holding pools" that would cause any unrecovered shot being carried by a torrent to settle in these areas before reaching the reservoir.

The property ESC currently leases from the Town of Exeter consists of approximately three acres. The current ESC lease covers only a portion of the original shotfall zone (i.e., the land on which shot falls). Much of the original shotfall zone is on the OSRAM-Sylvania land or beyond the current trap range on land of a private landowner. In the current lease, the Town of Exeter recognizes and agrees that ESC bears responsibility only for "activities of the Tenant after the execution of this Lease". The lease states as follows (quoting the relevant portion of Section 20-Indemnification):

> "The intent of this provision is to indemnify the Landlord against any claim, expense, damage, loss or liability paid, suffered or incurred by the Landlord as a result of any such damage or harmful activity of the Tenant ***after the execution of this lease***." [emphasis added]

At the direction of ESC, this ESP was developed to apply specifically to the present leasehold, and to fulfill ESC responsibilities under Section 12-Environmental Stewardship Program of the current lease, which states:

> "The Tenant shall adopt, implement and update as appropriate an environmental stewardship program consistent with similar programs recommended for active shooting ranges by the National Shooting Sports Foundation. A copy of the environmental stewardship program shall be provided to the Landlord for its file, as required, with the

proper agency approvals. The Tenant further agrees to seek and pursue approval of such a program on a periodic basis by the US EPA for so long as such approval continues to be available under EPA regulations in existence as of the date of the commencement of this Lease."

Such "approval" of ESC's program is not available because as of some time in 2009 and continuing in April 2011, EPA has discontinued its program of review and recognition of environmental stewardship programs of shooting ranges.

3.0 PLAN OF ACTION

3.1 IDENTIFICATION AND EVALUATION OF POTENTIAL MANAGEMENT ACTIONS

Section 1.3 presents environmental goals for range management. The existing environmental conditions at the site that might warrant consideration for management are described in Section 2. Section 3.2 describes site-specific actions identified and evaluated as appropriate to achieve the goals based on the knowledge, experience, and professional judgment of the preparer of the initial ESP in relation to the following factors:

- appropriateness to the present and anticipated future environmental regulatory status of shooting ranges
- environmental soundness
- appropriateness to site-specific conditions
- consistency with operational needs
- practicality
- implementability
- cost-effectiveness
- compatibility with the needs of shooters

3.2 MANAGEMENT ACTIONS TO BE IMPLEMENTED

The actions to implement the ESP consist of the following general types, alone or in combination:

a) Management Actions [e.g., assign personnel responsible for initiating, conducting, and completing the actions, and establish schedules for each major step]

b) Operational Actions [e.g., collect soil samples for pH analysis]

c) Construction Actions [e.g., perform site preparation work, get bids, institute soil pH management recommendations]

d) Finance Actions [e.g., estimate the cost of actions, identify the necessary funds to finance actions, establish funding schedules]

The major steps necessary to implement each action are summarized following the description of the action. These steps may be modified as appropriate, and ESC personnel responsible for implementing the actions may identify additional detailed steps. Some actions are related (e.g., re-establishment of vegetation after lead reclamation is related to maintenance of vegetation to minimize erosion), and implementation of related actions should be coordinated.

Goal 1: Limit the future distribution of shooting-associated materials to the ESC leasehold

It is important that ESC manage the bullets and shot on the leasehold. The backstop of the rifle/pistol range, the overhead baffles, and the side berms act to keep bullets on this range. No operational action appears necessary to achieve Goal 1 for the rifle/pistol range, although it is important to confirm that the above bullet containment features meet National Rifle Association (NRA) guidelines. Since 1987, the ESC has restricted shot to only steel or bismuth (i.e., no lead shot). After CDM surveyed the property and the easterly boundary was formally determined in about 2002, the ESC has limited firing to stations 3, 4, and 5 to prevent shot from falling outside the leasehold. Management actions are appropriate so that when standard trap shooting resumes as this ESP is implemented, shot will be restricted to the leasehold.

Action 1: Confirm that the rifle/pistol range is consistent with guidance in the NRA Range Source Book (NRA 2004) for backstop and side berm height and overhead baffle design and placement. Based on results, determine the need for modification(s), and identify, schedule, and implement the modification(s).

Step 1: Identify the applicable guidance in the Range Source Book (NRA 2004).

Step 2: Determine the height of the backstop and north side berm, and the design and placement of the overhead baffles.

Step 3: Document that the backstop, side berm, and baffles are consistent with NRA (2004) guidance. If not consistent, identify possible modifications to make the range consistent with the NRA (2004) guidance.

Step 4: If appropriate, select the appropriate modification(s), determine the necessary steps, and schedule implementation.

Step 5: Discuss with the Town, and if appropriate, design and construct a side berm on the south side of the range consistent with NRA (2004) guidance. (If the option chosen to implement Action 4 involves excavation of soil from the trap range, this soil may be used in constructing the side berm. Although this soil may

contain lead, its use for shooting purposes on the same property is consistent with EPA (2001) guidance if its other characteristics are appropriate. If soil from the trap range is used in side berm construction, both the inner and outer faces of the entire length of the side berm should be included in pH monitoring and adjustment under Action 6.)

Action 2: Identify potential management alternative or combination of alternatives, and implement the optimal alternative(s) so that shot is confined to the trap field.

Step 1: Locate the downrange boundary of the leasehold.

Step 2: Locate the lateral extent of the shotfall zone from the shooting positions to the downrange boundary of the leasehold. The lateral extent of the shotfall zone will be required to properly position and size any barrier[2] or shot curtain[2] that might be used to protect the downrange boundary of the leasehold. The lateral extent of the shotfall zone can be identified by careful examination of bare spots of ground for shot, and by sieving dry soil through metal window screen to separate shot. If necessary, twigs and organic debris can be floated off the screen in a bucket of water. Lead shot can be distinguished from steel shot and sand by the way it flattens when squeezed with pliers. Steel shot can be removed with a magnet. A useful approach is to begin where accumulations of shot are easily visible on the ground and proceed away from the centerline of shooting, examining and/or sieving soil at approximately 40-ft intervals. From the first point at which *no* shot is found by sieving, proceed approximately 20 feet back toward the centerline of shooting and carefully sieve for shot on the ground. If *no* shot is found there, consider that point the lateral extent of the shotfall zone. If *any* shot is found there, consider the point 20 feet farther from the centerline at which *no* shot was detected to be the lateral extent of the shotfall zone.

Step 3: Identify possible modifications, or combinations of modifications, to the trap range to prevent shot from any trap shooting position and target presentation falling beyond the leasehold downrange or laterally, including such options as:

- re-locating and/or re-orienting the trap in relation to the downrange leasehold boundary
- using barriers or shot curtains to prevent shot from reaching the downrange leasehold boundary or the southern leasehold boundary along the shoreline
- other alternatives that would keep shot from reaching the downrange or southern leasehold boundary

[2] Barriers and shot curtains are structures designed and placed to block shot from areas where it is unwanted. As used here, barriers are relatively small structures that block shot from small streams, wetland areas, etc. Barriers could include plywood sheet fences, earthen mounds, and "tents" of horticultural shade cloth over streams or wetlands to divert falling shot. Shot curtains are larger structures to intercept shot, promising but as yet unproven in widespread practice. Consideration of barriers and shot curtains involves initial cost, maintenance, replacement, efficacy, shooter acceptance, etc.

Step 4: Determine the benefits (including environmental benefits), limitations (including habitat destruction or alteration), and approximate costs (including installation and maintenance) of each alternative identified.

Step 5: Select the optimal alternative or combination of alternatives and develop appropriate design(s).

Step 6: Determine the major construction steps and complete construction.

Goal 2: Avoid shooting over or into water and wetlands

It is important that bullets, shot, wads, and targets not be discharged into "waters of the United States". The location, orientation, and bullet containment features of the rifle/pistol range indicate bullets from this range will not reach "waters of the United States", and no operational action is necessary to achieve Goal 2 for the rifle/pistol range. The trap field is located and oriented so that standard trap shooting would not reach the shoreline, and Action 2 will confirm this. No other action is necessary to achieve Goal 2 for the trap range.

Goal 3: Periodically reclaim and recycle lead

Lead should be reclaimed consistent with EPA (2001) and NHDES (2000) guidance on best management practices for lead at outdoor shooting ranges, which ESC personnel should carefully review. In much abbreviated summary, this guidance is to reclaim and recycle lead (Actions 3 and 5) as frequently as can be justified, and between reclamation activities manage the areas containing lead as appropriate (other Actions) to minimize physical and chemical mobility of shooting-associated materials. The EPA (2001) and NHDES (2000) guidance is clear that lead reclamation be conducted at a frequency appropriate for each range, determined in consideration of range-specific environmental and operational conditions that include cost. Although the primary goal is to minimize potential for adverse environmental effects, reclamation frequency is not to be driven overwhelmingly by environmental caution with minimal recognition of the economic realities under which the range operates. Neither are economic realities to become an excuse for minimizing environmental benefits realized through reclaiming and recycling lead as frequently as can be justified. Because environmental circumstances, range use, operational conditions, reclamation technology, lead market conditions, and other relevant factors may vary over time, the appropriate intervals between lead reclamations cannot be specified and are likely to vary. Appendix A presents factors to consider when evaluating a company to reclaim lead for recycling consistent with EPA (2001) and NHDES (2000) guidance.

Action 3: Reclaim and recycle bullets from the floor and backstop of the rifle/pistol range consistent with EPA (2001) and NHDES (2000) guidance.

Step 1: Institute a program of monitoring and maintaining records of the estimated quantity of bullets of various calibers fired on the rifle/pistol range. The goal is to maintain a general indication of the estimated quantity of lead accumulating in the backstop. To do so it is not necessary to maintain records for

every caliber, but perhaps differentiate between .22 rimfire, .30 caliber, and .40 caliber and larger bullets, for instance.

Step 2: Determine appropriate methods and costs for reclaiming and recycling bullets and bullet fragments from the range floors and backstops considering the approximate value of the recycled lead.

Step 3: Determine whether it is preferable for ESC to reclaim lead itself from the rifle/pistol range, or contract with a professional lead reclamation company.

- Self-reclamation may or may not be less expensive. Appropriate equipment and some degree of operator skill are required. A buyer must be found for the lead, and the lead must be delivered to the buyer. ESC would bear the fluctuations in the lead market. Occupational Health and Safety Administration (OSHA) requirements apply to employees, and a "volunteer" who receives any direct or indirect compensation (e.g., free shooting, lower dues, lead for reloading) is considered an employee under OSHA.
- Professional reclamation is a turnkey operation, with the reclamation company bearing all the costs of equipment, insurance, bonding, worker protection, fluctuating lead prices, etc., and proper disposition of the lead. Cost may not exceed the total cost of self-reclamation.

Step 4: If professional reclamation is preferable, identify candidate companies with experience in satisfactorily reclaiming and recycling bullets from rifle/pistol ranges.

Step 5: Plan and budget for reclamation and recycling operations when reclamation is feasible consistent with EPA (2001) and NHDES (2000) guidance. Because the reclamation methods used for bullets are different from those used for shot, and lead accumulates at different rates on rifle/pistol and trap ranges, it may or may not be advantageous to coordinate reclamation from the rifle/pistol range and the trap range.

Step 6: When sufficient lead has accumulated to warrant reclamation and recycling according to EPA (2001) and NHDES (2000) guidance, schedule, conduct, and record these activities.

Step 7. Re-establish vegetative ground cover as appropriate after reclamation to minimize erosion without attracting seed-eating birds (see Action 10).

Action 4: Prior to resuming trap shooting with lead shot, maximize the practicality of reclaiming shot from the trap range shotfall zone (which Action 2 has restricted to the current ESC lease) consistent with EPA (2001) guidance, ESC needs, shooter acceptance, and other relevant considerations.

Step 1: Determine the requirements of applicable water management regulations (e.g., infiltration) and other applicable requirements.

Step 2: Determine the most appropriate way to remove brush, trees, and stumps, which will be necessary before any new design for the shotfall zone can be implemented. Consider the possibility of excavating the surficial soil from the shotfall zone for constructing a side berm on the rifle/pistol range in Action 1, and the quantity of soil that might be removed.

Step 3: Identify possible design concepts for the shotfall zone to facilitate lead shot reclamation, considering options such as, for instance:

- covering the shotfall zone with appropriate grass
- covering the shotfall zone with several inches of sand of a size to optimize recovery of shot by sieving
- covering the shotfall zone with several inches of compacted stabilized gravel from which shot could be swept or vacuumed
- paving the shotfall zone with concrete or asphalt from which shot could be swept or vacuumed
- modification of shot curtains, if installed in Action 2, to facilitate collection of lead shot at the base of the curtains
- other options as may be identified
- combinations of options to optimize lead shot reclamation under site-specific conditions

Step 4: Identify possible techniques for reclaiming lead shot from the possible shotfall zone surfaces considered in Step 3, and the advantages, limitations, proven reliability, and cost of each technique.

Step 5: Considering the findings of Steps 3 and 4, determine the most appropriate design concept for the shotfall zone at ESC to optimize lead shot reclamation.

Step 6: Prepare the engineering design necessary for construction. Schedule and implement construction.

Action 5: Reclaim and recycle lead shot from the trap range on the ESC leasehold to the maximum extent practical consistent with EPA (2001) and NHDES (2000) guidance.

Step 1: Institute a program of monitoring and maintaining records of the quantity of lead shot fired on the trap range (this can be approximated satisfactorily from the number of targets thrown, assuming that approximately 1 to 1-1/8 ounce of shot is fired at each target).

Step 2: Determine whether it is preferable for ESC to reclaim lead itself from the trap range, or contract with a professional lead reclamation company, as described for Action 3, Step 3.

Step 3: If professional reclamation is preferable, identify candidate companies with experience in satisfactorily reclaiming and recycling lead shot from shotgun venues considering the findings of Action 4, Step 4 .

Step 4: Plan and budget for reclamation and recycling operations from the trap range when reclamation is feasible consistent with EPA (2001) and NHDES (2000) guidance. Because the reclamation methods used for shot are different from those used for bullets, and lead accumulates at different rates on rifle/pistol ranges and trap ranges, it may or may not be advantageous to coordinate reclamation from the rifle/pistol and trap ranges.

Step 5: When sufficient lead shot has accumulated to warrant reclamation and recycling according to EPA (2001) and NHDES (2000) guidance, schedule, conduct, and record these activities.

Step 6: If the shotfall zone is maintained in vegetative ground cover, restore the ground cover as appropriate after reclamation to minimize erosion without attracting seed-eating birds (see Action 11).

Action 6: Remain current on advances in non-lead shot, and re-evaluate its use as warranted (which would end the need for ongoing lead reclamation from the trap range).

Step 1: Periodically investigate recent advances in non-lead shot relative to issues that presently limit its acceptability for clay target shooting.

Step 2: If warranted, initiate a shooter acceptance program followed by instituting exclusive use of suitable non-lead shot after reclaiming lead shot on the trap range at that time.

Step 3: Establish and enforce policies and rules allowing only non-lead shot on the trap range.

Goal 4: Prevent shooting-associated materials on the ESC leasehold from migrating off the leasehold through surface water and groundwater

The combination of site characteristics discussed in Section 2.3 indicates dissolved or particulate metals associated with shooting have a low potential to migrate off-site through surface water runoff or groundwater. This is confirmed by the site studies of CDM (2003) and URS (2006), which found that surface water and groundwater have not been significantly impacted by gun range activities", after shooting at the ESC ranges for approximately 50 years. Even so, prudent management warrants appropriate action to minimize potential chemical mobility of dissolved metals and to minimize physical mobility of shot and lead particles weathered from shot or bullets.

Action 7: Periodically monitor surficial soil pH on the rifle/pistol range backstop and range floor, and the trap range, and adjust the pH (if necessary) as indicated by soil

monitoring results to maintain surficial soil pH between 6.5 and 8.5. This is the soil pH recommended at shooting ranges by EPA (2001) and NHDES (2000) to minimize the potential for metals to enter groundwater or surface water in dissolved form.

Step 1: Measure the pH of surficial soil on the backstop and range floor (and new side berm if constructed with soil from the shotfall zone) and throughout the shotfall zone, and monitor annually. See Appendix B for soil pH monitoring procedures.

Step 2: Determine need for pH adjustment. According to EPA (2001) and NHDES (2000) guidance, if the pH of surficial soil is between 6.5 and 8.5, there is no need for pH adjustment. If the pH is below 6.5, it should be adjusted upward. This can be accomplished by application of agricultural lime or other suitable material to raise pH consistent with EPA (2001) and NHDES (2000) guidance.

Step 3: If pH adjustment is warranted, determine the amount of lime or other material required. Consult with U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), local college or university agriculture departments, knowledgeable nurseries or horticulturalists, or other reliable sources for advice on the appropriate form, amount, and application rate of agricultural lime or other suitable material. Soil pH adjustment by adding lime or other material is not a precise process. It is appropriate to add the amount of lime recommended to adjust soil pH to approximately 7.0 to 7.5 and adjust the pH again later if necessary, recognizing that the objective is that the adjusted soil remain between pH 6.5 and 8.5 as recommended by EPA (2001) and NHDES (2000).

Step 4: Determine the optimal form of lime or other suitable material and application method. Different forms of lime may have different costs, and the cost and practicality of application may vary among methods. Possible application methods include:

- Pelletized lime applied with agricultural or horticultural equipment, a salt spreader mounted on an ATV, with a hand spreader. Pelletized lime tends to dissolve slowly.

- Powdered lime applied with agricultural or horticultural equipment. This is the most common type and application of lime. Powdered lime acts more rapidly that pelletized lime.

- Liquid lime applied with a pump and hose from a tank on a trailer behind a tractor. If applied at an appropriate rate when the soil is not saturated with water, liquid lime will soak into the ground and exert its effect where it is applied. Liquid lime acts more rapidly that other forms of lime.

Step 5: Select the optimal form(s) and application method(s), determine the necessary steps, and schedule implementation. Apply appropriate amounts and forms of lime or other suitable material to the backstop, range floor (and new side berm if constructed with soil from the shotfall zone), and the shotfall zone on the ESC leasehold as necessary.

Step 6: Monitor soil pH annually and maintain records of soil pH sampling and results to document that pH remains between 6.5 and 8.5, and to determine when additional application of lime or other suitable material may be necessary.

Action 8: Manage ground cover through which runoff passes as it moves off the rifle/pistol range floor and the shotfall zone to minimize the potential for lead particles, shot, target fragments, wads, and hulls to be carried off the ranges by surface runoff.

Step 1: Determine appropriate types of ground cover for the backstop, range floor, and downgradient areas over which runoff passes, considering ability to hold soil, slow sheet flow of runoff, fertilizer requirements, sunlight requirements, drought tolerance, mowing frequency, etc. consistent with the objectives of other Actions. Different types of ground cover may be appropriate for various areas (e.g., vegetative ground cover in areas with sufficient sunlight, and non-living ground cover such as leaf litter where less sunlight reaches the ground).

Step 2: Determine optimal methods and schedule for shifting ground cover, if appropriate, to the desired types.

Step 3: Implement the selected methods to shift the ground cover, if appropriate, to the desired types.

Step 4: Implement appropriate activities to maintain the desired ground cover on the backstop, range floor, and shotfall zone on the ESC lease.

Action 9: Manage and maintain areas as appropriate in which lead particles can settle from runoff from the rifle/pistol range and shotfall zone. Appropriately located, designed, and constructed areas in natural runoff pathways from the shotfall zone will also be helpful in retaining hulls (Action 12), wads (Action 13), and target fragments (Action 14).

Step 1: Confirm that existing settling areas are appropriately located in topographical lows along which runoff moves down-slope from the full length of the rifle/pistol range, and across the shotfall zone on the ESC leasehold. Settling areas should be constructed in these lows to help retain lead particles and shot.

Step 2: Investigate applicable State and local stormwater management regulations and confirm that settling areas are designed and constructed consistent with regulations to accomplish ESP purposes without requiring stormwater permits, if possible.

Step 3: Determine that the locations and sizes of the areas are appropriate, considering access for maintenance in Step 6. The sizes of areas to allow effective settling will depend on the volume of runoff each area must accommodate. A series of multiple small settling areas along each natural runoff pathway is likely to be more appropriate than fewer and larger settling areas.

Step 4: Confirm that the settling areas are designed and constructed to optimize accumulation of lead particles and shot.

Step 5: Maintain the effectiveness of the settling areas as necessary. The areas will lose their effectiveness as settling areas as they fill with accumulated soil, lead particles, and/or shot that must be removed as necessary. Material removed from the settling areas should not simply be spread adjacent to the settling area so that it will not rapidly refill the settling area. The removed material will contain shot and lead particles, and should be managed consistent with EPA (2001) guidance; options for managing material removed from the settling areas and any lead it contains include:

- Consistent with EPA (2001) and NHDES (2000) guidance, all the settled material that may contain lead particles and shot removed from the settling areas could be spread over the backstop or range floor, or shotfall zone, where shooting will continue to deposit lead that will be managed by ongoing environmental stewardship to achieve the Goals of this ESP.

- Lead may be separated from other material for recycling. (Cost of acquiring the material plus the cost of separating the lead may well exceed the scrap metal value of the lead.) Consistent with EPA (2001) and NHDES (2000) guidance, the residual material after lead is removed could be spread over the portions of the range floor and/or shotfall zone where it will be included in ongoing environmental stewardship to achieve the Goals of this ESP.

Step 6: Create access routes to the settling areas to facilitate removal of accumulated material. The scale of the settling areas is likely to be such that access by an ATV-like vehicle, or perhaps even a wheelbarrow, will be satisfactory. Consider access when positioning the settling areas. Locate, construct, and maintain access to minimize potential soil erosion along the access routes.

Action 10: Protect and monitor groundwater quality through the existing monitoring wells.

Step 1: Protect groundwater quality by taking steps available to ESC to encourage the Town to secure the wells to prevent the possibility of vandalism, terrorism, or other illicit activity introducing toxins or contaminants into the groundwater through the wells.

Step 2: Request the Town to share well monitoring data as it is collected so that ESC can observe any developing trends as they become apparent, correlate them with ongoing management Actions under this ESP, and make adjustments as appropriate.

Goal 5: Discourage ingestion of shot by birds

Seed-eating birds may incidentally ingest shot, either as grit or perhaps mistaking it for seed, if they feed in areas containing small lead particles, including the backstop, range floor, and the shotfall zone if vegetative cover is chosen in Action 4. Feeding activities by seed-eating birds are discouraged where grass is thick with few bare spots and tall enough to conceal predators, yet not allowed to develop seeds that might serve as food. Prudent management warrants consideration of the following action to minimize the potential for incidental ingestion of lead particles by seed-eating birds.

Action 11: Maintain the backstop and range floor (and shotfall zone if vegetative cover is chosen in Action 4) in grass too tall to be attractive to seed-eating birds and too short to be attractive to birds preferring brushy habitat (i.e., resembling a lawn that badly needs mowing, but not allowed to develop seed heads). Such areas tend not to attract seed-eating birds, and thereby minimize the potential for them to incidentally ingest shot.

Step 1: Determine appropriate type of vegetation to minimize attractiveness to seed-eating birds considering fertilizer requirements, drought tolerance, sunlight requirements, mowing frequency, etc. consistent with the objectives of other Actions. (Fescue is not attractive to most birds and wildlife, and may be considered if it is satisfactory in other regards.) Different types of vegetation may be appropriate for various areas.

Step 2: Determine optimal methods and schedule for shifting vegetation, if appropriate, to the desired types in the various areas.

Step 3: Implement the selected methods to shift the vegetation, if appropriate, to the desired types on the shotfall zone in coordination with other management actions.

Step 4: Implement appropriate activities to maintain the desired vegetation.

Goal 6: Optimize management of rifle/pistol cartridge cases and shotgun hulls, wads, and clay targets

Rifle/pistol cartridge cases and shotgun hulls, wads, and target fragments can be regarded as litter, especially if washed or blown off the range. Removal of these materials also eliminates the source of any possible concern about materials that might have some slight potential to leach from them.

Action 12: Collect cartridge cases from the rifle/pistol range (including .22 rimfire cases), and hulls from the trap range as warranted, and manage consistent with accepted practice so they do not accumulate at the shooting positions, where they might interfere with lawn maintenance or cause a small but potentially serious safety risk of shooters tripping.

Step 1: Determine the most cost-effective method of collecting cartridge cases and hulls, considering hand picking, raking, vacuuming, specially designed commercial equipment (e.g., Ammo-Up, www.ammoupusa.com; Brass Wizard, www.uniquetek.com), and other possible methods. At many ranges, shooters are encouraged to pick up their cases or hulls for personal reuse or place them in convenient containers for reuse or disposal by the range.

Step 2: Collect cartridge cases and hulls as frequently as warranted based on accumulation, appearance, potential to be washed off the range, cost, and other relevant considerations. It may or may not be appropriate to collect hulls and wads at the same time.

Step 3: Brass cartridge cases are typically reused or recycled as scrap metal. Hulls are typically disposed as trash. Investigate the practicality, cost-effectiveness, benefits, and limitations of recycling hulls[3] as well as other methods of disposition.

Step 4: If warranted, begin recycling hulls. If another method of disposition proves more appropriate, initiate that method.

Action 13: Collect wads from the trap range as warranted, and manage consistent with accepted practice to minimize the potential of washing or blowing off the range.

Step 1: Determine the most cost-effective method of colleting wads, considering raking by hand or with commercial lawn equipment, vacuuming with commercial leaf vacuums or small vacuum trucks, and other possible methods.

Step 2: Collect wads as frequently as warranted based on accumulation, appearance, potential to be washed or blown off the range, cost, and other relevant considerations, and dispose them as trash. It may or may not be appropriate to collect wads and hulls at the same time.

Step 3: Investigate the practicality, cost-effectiveness, benefits, and limitations of recycling plastic wads (which are made of polyethylene), as well as other methods of disposition. Recycling options to be investigated include possible commercial recycling for profit, placing wads in the plastics bin at a public recycling center, and other options as may become apparent.

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[3] Collins International (contact: Tom Walters, telephone 773-650-9900, email twalters@collinsmetal.com) reported in October 2009 that it sometimes buys and recycles hulls for their brass content.

Step 4: If warranted, begin recycling wads. If another method of disposition proves more appropriate, initiate that method.

Action 14: Collect asphalt pitch target fragments from the trap range as warranted, and manage consistent with accepted practice.

Step 1: Determine the most cost-effective method of colleting target fragments, considering raking or scraping with conventional earthmoving equipment, and other possible methods.

Step 2: Collect target fragments as frequently as warranted based on accumulation, appearance, potential to be washed off the range, cost, and other relevant considerations, and dispose them as solid waste after appropriate testing. If intervals are similar, it may be cost-effective to collect target fragments at the same time as shot so that both are accomplished with one equipment mobilization and one interruption of shooting.

Step 3: Investigate the practicality, cost-effectiveness, benefits, and limitations of recycling target fragments, as well as other methods of disposition. While at present there is no known routine practice of recycling target fragments, asphalt pitch target fragments have been recycled on a sporadic basis at asphalt plants for their approximately 33% pitch content, or as aggregate in paving mix. Asphalt plants that accept petroleum-contaminated soil may also accept asphalt pitch target fragments.

Step 4: If Step 3 indicates that cost-effective recycling of asphalt pitch target fragments may be practical, determine the approximate quantity of target fragments this would require.

Step 5: If practical, when sufficient asphalt pitch target fragments have accumulated to warrant reclamation and recycling, schedule, conduct, and record these activities. If another method of disposition proves more appropriate, initiate that method.

Step 6: Re-establish vegetative cover after reclamation as appropriate to minimize erosion.

Action 15: Remain current on advances in biodegradable clay targets formulated to contain no materials of environmental concern, and re-evaluate their use as warranted. First-generation biodegradable clay targets are composed primarily of clay mineral with a sulphur-based binder. The clay mineral residue left after the targets degrade has no nutrient or organic content and the sulfur increases the acidity of the residue. These characteristics can result in environmental issues related to the inability of accumulations of biodegradable target residue to support plant growth (and to actually kill plants, including trees, already present), and to the possibly enhanced dissolution of the small proportion of shot that falls in the same area as the targets. Under most circumstances,

the environmental advantages of biodegradable clay targets more than offset the management effort required to avoid these possibilities. If biodegradable targets are used, the deposits of residue from biodegraded targets must be managed to provide plant growth on the deposits, minimize the potential dissolution of the small proportion of shot that falls there, and prevent off-site transport of residue in surface runoff.

Step 1: Periodically acquire information from NSSF and elsewhere, and investigate recent advances in biodegradable targets relative to performance issues at ESC.

Step 2: If warranted, determine the availability, cost, and performance of biodegradable targets of various compositions under the conditions at ESC, with consideration of the necessary frequency and intensity of management according to the following steps.

Step 3: If warranted, institute exclusive use of suitable biodegradable targets after removing deposits of old asphalt pitch clay target fragments.

Step 4: Determine the pH of the deposits of degraded target residue. The pH of these areas should be determined as described in a previous Action for soil. Data records should identify these areas distinct from the soil acidity of the general shotfall zone. The pH of the biodegradable target residue should be monitored bi-weekly for at least several months until a clear picture of the rate and degree of pH change under the site-specific conditions is established. The monitoring frequency may then be adjusted consistent with this experience.

Step 5: Apply lime to the deposits of target residue as appropriate to maintain the pH between 6.5 and 8.5. Measurements may well need to be made, and lime applied, more frequently (perhaps much more frequently) and perhaps in greater amounts on the deposits of target residue than on the shotfall zone in general.

Step 6: Add grass clippings, shredded leaves, manure, mulch, or similar material to the deposits of target residue to provide organic matter and nutrients to obtain satisfactory plant growth.

Step 7: Implement appropriate activities to maintain the desired vegetation on the deposits of target residue.

Goal 7*: *Maintain this ESP as an up-to-date "living" document

The initial ESP was developed pro-actively on the initiative of ESC with the expectation that it would be reviewed and revised as appropriate based on implementation experience. Some of the management Actions are one-time activities that, once completed, will not be necessary in subsequent revisions of the ESP. Implementation experience, advancing technology, revised regulations, and other changing conditions may identify better ways of implementing Actions or other actions that may be appropriate. This ESP and the activities to implement it should be

modified as appropriate to remain current with the state-of-the-practice of environmental management of outdoor shooting ranges.

Action 16: Annually ESC will review implementation of the ESP during the past year and adopt a revised and updated ESP as appropriate for the coming year.

Step 1: Assign a person overall responsibility for the ESP.

Step 2: At least annually evaluate and revise the ESP as appropriate by considering and addressing relevant issues, including but not limited to:

- which goals of the ESP were fully achieved, partially achieved, not achieved, and not yet addressed
- lessons learned through implementation experience with the ESP, including topics that may require improvement
- which activities can be combined or conducted with better efficiency and effect
- what activities (if any) are no longer appropriate
- what activities (if any) should be added
- changes that have occurred in the operation of the facility, government regulations, new environmental considerations, etc. that may make revisions to the ESP appropriate
- advances in science and technology that can be practically and advantageously implemented
- any other issues appropriate to be considered for the improvement and implementation of the ESP

Step 3: Prepare an updated ESP for the coming year and recommend it to ESC management for acceptance and implementation.

4.0 IMPLEMENTATION

4.1 SCHEDULE OF ACTIONS TO IMPLEMENT PLAN

The schedule of actions to implement the ESP considered appropriate at the time of development of the ESP is presented in Appendix C.

4.2 RESPONSIBILITY FOR ACTIONS TO IMPLEMENT PLAN

The responsibilities for implementation of the ESP considered appropriate at the time of development of the ESP are presented in Appendix D.

5.0 MEASURING SUCCESS

It is important to not only conduct the management actions identified in this ESP, but to determine the success of those actions in achieving their objectives, and to maintain records documenting the success. These records will provide the basis for updating and refining the ESP as discussed in Action 16, and will be useful if ESC ever finds it desirable to document its environmental stewardship activities.

Appropriate approaches to measuring success will be developed by the individuals responsible for implementation of each action, including detailed procedures as necessary for measuring and documenting success and for determining appropriate refinements. Measurement and documentation approaches may include such things as:

- records such as designs, requests for bids, invoices, checks, receipts, dated before-and-after photographs, etc.
- records that demonstrate the need and the completion of the action (e.g., internal records of accumulation of bullets, pH testing records, etc.)
- records of vegetation management
- records of the factors considered in making decisions
- descriptions of the development of cost estimates, etc.

6.0 REFERENCES

Baer, K.N., et al. 1995. *Toxicity Evaluation of Trap and Skeet Shooting Targets to Aquatic Test Species.* Ecotoxicology, vol. 4:385-392.

CDM. 2003. *Town of Exeter, New Hampshire, Lead Shot/Firing Range Assessment – Phase II.* Report prepared by Camp Dresser & McKee, Inc, Cambridge, MA for the Town Of Exeter Department of Public Works. Report dated December 2003.

EPA. 2001. *Best Management Practices for Lead at Outdoor Shooting Ranges.* EPA-902-B-01-001. U.S. EPA Division of Enforcement and Compliance Assistance, RCRA Compliance Branch, 290 Broadway, 22nd Floor, New York, NY 10007-1866. January 2001 (revised June 2005). www.epa.gov/region2/waste/leadshot.

NHDES. 2000. *A Call to Action for Sportsmen's Clubs and Shooting Ranges: Getting the Lead Out*. Environmental Fact Sheet WMD-HW-19, published by the New Hampshire Department of Environmental Services, Concord, NH. http://des.nh.gov/organization/commissioner/pip/factsheets/hw/documents/hw-19.pdf

NRA. 2004. *Range Source Book*. National Rifle Association, Range Department, 11250 Waples Mill Road, Fairfax VA 22030. NRA# NR60401AR14861.

NRCS. 2008. Web Soil Survey. U. S. Department of Agriculture, Natural Resources Conservation Service (NRCS). Soil Maps Version 1 (December 8, 2004) and Soil Data Version 10 (October 27, 2009), accessed February 9, 2011. http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

NSSF. 1997. *Environmental Aspects of Construction and Management of Outdoor Shooting Ranges*. Facilitates Development Series No. 2. National Shooting Sports Foundation, Facilities Development Division, 11 Mile Hill Road, Newtown, CT 06470-2359. 1997. www.rangeinfo.org

Peddicord, R. K. and J. S. LaKind. 2000. *Ecological and human health risks at an outdoor firing range*. Environ. Toxicol. & Chem., Vol. 19, No. 10.

URS. 2006. *Site Specific Environmental Study Report, Exeter Sportsman's Club, Exeter, New Hampshire*. Report prepared by URS Corporation, Salem, NH, for the Town Of Exeter Health Department. Report NHDES # 200212050 dated November 8, 2006.

Remington. 1994. *Material Safety Data Sheet: "Blue Rock" Trap and Skeet Targets*. Remington Arms Company, Inc., P. O. Box 390, Findlay OH 45840. April 1994.

Remington. 1995a. *Material Safety Data Sheet: Centerfire Rifle, Pistol and Revolver Loaded Round*. Remington Arms Company, Inc., 870 Remington Road, Madison NC 27025-0700. April 1995 (revised October 2001). www.remington.com/pdfs/msds/cfrifpis.pdf.

Remington. 1995b. Material *Safety Data Sheet: Shotshell Loaded Round*. Remington Arms Company, Inc., 870 Remington Road, Madison NC 27025-0700. April 1995 (revised October 2001). www.remington.com/pdfs/msds/ssload.pdf.

Remington. 2001a. Material *Safety Data Sheet: Component Shotshell Wads*. Remington Arms Company, Inc., 870 Remington Road, Madison NC 27025-0700. www.remington.com.

Remington. 2001b. Material *Safety Data Sheet: Component Empty Shellcases (Unprimed) (Shotshell)*. Remington Arms Company, Inc., 870 Remington Road, Madison NC 27025-0700. October 2001. www.remington.com.

7.0 NOTICE

Dick Peddicord & Company, Inc. accepts no responsibility or liability associated with any use Exeter Sportsman's Club, or other entity may make of this Environmental Stewardship Plan and/or its contents, recommendations, guidance, or lack thereof. The initial Environmental Stewardship Plan reflects the state of the practice of environmental management of outdoor shooting ranges at the time it was prepared, and the recommended actions are considered suitable for their purposes. Dick Peddicord & Company, Inc. assumes no responsibility for the nature or consequences of any revisions or lack thereof Exeter Sportsman's Club may make as it revises the ESP through implementation experience.

Based on project activities, Dick Peddicord & Company, Inc. does not warrant that there are no toxic or hazardous materials or contamination associated with the subject properties. Dick Peddicord & Company, Inc. accepts no liabilities if such are found in the future, or could have been found if additional sampling or studies were conducted. Dick Peddicord & Company, Inc. does not assume responsibility for other environmental issues that may be associated with the subject properties.

This project was conducted for Exeter Sportsman's Club and relied on Exeter Sportsman's Club for the completeness and accuracy of the site-specific plans, information, and data it provided. The project was based in part on third party information not within the control of either Exeter Sportsman's Club or Dick Peddicord & Company, Inc. While it is believed that the third party information is appropriate for the uses made of it, neither Exeter Sportsman's Club nor Dick Peddicord & Company, Inc. assumes responsibility for its accuracy or the implications of its use.

In view of the changing status of environmental laws, regulations, guidance, and procedures, Dick Peddicord & Company, Inc. cannot be responsible for changes in laws, regulations, guidance, or procedures that occur after this project has been completed and which may affect the subject properties.

Appendix A

Checklist of Considerations in Selecting Lead Reclaimers

Checklist of Considerations in Selecting Lead Reclaimers

Company				Criteria	Importance
A	B	C	D		
				Company has established operating history of at least 5 years and references	**Minimizes performance risk** - ensures proper contractor business registration and lowers risk of uncompleted or unsatisfactory work
				Company owns state-of-the-art lead recovery and separation equipment	**Maximizes lead value** – processes produce the cleanest lead possible, maximizing lead value to range
				Company is of substantial size, including multiple crews and equipment	**Ensures project completion** - determines company's ability to handle weather delays, equipment breakdowns, or worker issues allowing for on-schedule completion
				Written health & safety plan, worker training certificates	**Minimizes potential workers' compensation suits involving range** - ensures workers are properly trained, documented, and protected
				Contract with range has liability indemnification clause	**Protects range owners and/or club** - lawsuits, while unlikely, might arise in conjunction with services provided
				Submittal of company's insurance certificate naming range as additional insured	**Standard contractor submittal** - provides proof of insurance protection, usually desired by range insurance provider; typical for contractors
				$2 million+ minimum General Liability (GL) and Lead Pollution Liability (PL) coverage	**Protects range assets** - GL provides in event of an accident, damage to the facility, or injury; PL covers all potential damages that could result from the mishandling of lead and environmental issues
				$1 million minimum workers' compensation and auto insurance	**Protects range assets** - provides range owners protection from contractor's employees suing range for injuries, short- or long-term disabilities, and against any auto damages or accidents while on the range
				Licensed lead recycler with certificate to recycle	**Range protection against fines** - provides required documents to validate proper lead disposal required by U.S. EPA
				Knowledge of state and federal lead environmental laws and guidelines recommended by U.S. EPA, NRA, and NSSF	**Avoids future environmental issues and fines** - knowledgeable contractors will have training and experience to properly handle the lead in soils, avoiding generating hazardous waste and assisting the club with maintaining best management practices

Appendix B

Procedures for Soil pH Measurements

Procedures for Soil pH Measurements

The following procedures are acceptable for determining the pH of surficial soil on the Exeter Sportsman's Club shooting ranges.

The pH of surficial soil should be determined annually for the rifle/pistol range backstop and floor, and the shotfall zone of the trap range on the ESC lease.

Soil pH measurements may be made in the field using a professional-quality soil pH meter available from scientific or horticultural equipment firms (e.g., soil analyzer, number JBO-152678, Ben Meadows, Inc., 800-241-6401, www.benmeadows.com, or a comparable product from other sources). Follow meter directions to take one reading at each location every sampling period. Surficial soil pH measurements should be made at the following locations:

- Backstop: approximately 5 locations scattered across the length and width of the face of the backstop
- Range floor: approximately 8 locations scattered across the length and width of the range floor
- Trap range: approximately 8 locations scattered across the length and width of the shotfall zone on the ESC lease

Because the data will be used to characterize each area as a whole and not to characterize precise spots, the locations at which measurements are made within each area can vary from time to time, although the same number of measurements should be taken within each area every time. If any area contains large sub-areas of obviously different soil types (e.g., sandy and clayey) or conditions (e.g., well-drained and poorly drained), a separate sub-set of soil measurements should be made from each soil type. Measurements are best made when the soil is not saturated with water.

A separate data table should be created for the backstop, range floor, and the trap range (and for each deposit of biodegradable target residue, if biodegradable targets are used). The tables should be structured to allow entry of the pH value measured at each location for each date. The average of the measurements for each area on each date should be calculated. Management decisions for each area should be based on the average of the pH measurements within the area, not on individual measurements. Because pH is a logarithmic scale, a correct average can be obtained only by taking the anti-log of each pH measurement, averaging those values, then taking the log of the average. A Microsoft Excel spreadsheet has been provided (Attachment 1) to record soil pH data and calculate the average pH this way. Instructions for using and copying the spreadsheet are at the bottom of each page.

Documentation of all pH sampling and results should be maintained as part of the ESP records.

Appendix C

Schedule of Actions to Implement Environmental Stewardship Plan

Schedule of Actions to Implement Environmental Stewardship Plan For Exeter Sportsman's Club

The following schedule of actions to implement the ESP is considered appropriate at the time of development of the initial ESP. Implementation experience or unforeseen circumstances may warrant modifications to the schedule indicated below. The actions and steps are summarized here from their full descriptions in Section 3.2; activities should be based on the full descriptions in the text rather than these summaries. The schedule is presented in both text and tabular format.

Action 1: Confirm that the rifle range backstops, side berms, and baffles are consistent with NRA guidance.

Step 1: Identify the applicable guidance in the Range Source Book. Summer 2011

Step 2: Determine height of backstop and side berm, and overhead baffle design and placement. Summer 2011

Step 3: Document that backstop, side berm, and baffles are consistent with NRA guidance. Summer 2011

Step 4: Select appropriate modification(s), determine necessary steps, schedule implementation. Summer 2011

Step 5: If appropriate, design & construct south side berm. Summer 2011

Action 2: Confirm that shot is confined to the trap field.

Step 1: Locate the downrange boundary of the leasehold. Summer 2011

Step 2: Locate extent of shotfall zone. Summer 2011

Step 3: Identify modification(s) to prevent shot falling beyond leasehold. Autumn 2011

Step 4: Determine benefits, limitations, & costs of alternative(s). Winter 2011

Step 5: Select optimal alternative(s) & develop design(s). Spring 2012

Step 6: Determine major construction steps & complete construction. Summer 2012

Action 3: Reclaim & recycle bullets from rifle/pistol range.

Step 1: Maintain records of quantity of bullets. Summer 2011

Step 2: Determine methods & costs for reclaiming bullets and fragments. Summer 2011

Step 3: Determine whether self-reclamation or professional reclamation is preferable. Autumn 2011

Step 4: If professional reclamation is preferable, identify candidate companies. Autumn 2011

Step 5: Plan & budget reclamation/recycling operations when feasible. Winter 2011

Step 6: Schedule, conduct, and record reclamation. As appropriate

Step 7. Re-establish vegetative ground cover. As appropriate

Action 4: Prior to resuming use of lead shot, maximize practicality of reclaiming shot.

Step 1: Determine applicable requirements. Summer 2011

Step 2: Determine appropriate way to prepare area before implementing new design for shotfall zone. Summer 2011

Step 3: Identify design concepts for shotfall zone. Autumn 2011

Step 4: Identify techniques for reclaiming lead shot from possible shotfall zone surfaces. Autumn 2011

Step 5: Determine the most appropriate design for the shotfall zone. Autumn 2011

Step 6: Prepare design necessary for construction. Schedule and implement construction. Winter 2011

Action 5: Reclaim and recycle shot from the trap field.

Step 1: Record quantity of lead shot fired on the trap range. Summer 2011

Step 2: Determine whether self-reclamation or professional reclamation is preferable. Winter 2011

Step 3: If professional reclamation is preferable, identify candidate companies. Winter 2011

Step 4: Plan & budget reclamation/recycling operations when feasible. As appropriate

Step 5: Schedule, conduct, and record reclamation. As appropriate

Step 6: If appropriate, re-establish vegetative ground cover. As appropriate

Action 6: Remain current on advances in non-lead shot, and re-evaluate its use as warranted.

Step 1: Investigate advances in non-lead shot. Summer 2011

Step 2: If warranted, initiate a shooter acceptance program and exclusive use of non-lead shot. As appropriate

Step 3: Establish and enforce only non-lead shot. As appropriate

Action 7: Periodically monitor and adjust surficial soil pH.

Step 1: Measure pH on rifle/pistol and trap ranges, and monitor annually. Summer 2011

Step 2: Determine need for pH adjustment. Autumn 2011

Step 3: If warranted, determine the amount of lime or other material required. Autumn 2011

Step 4: Determine optimal form of lime or other material and application method. Winter 2011

Step 5: Select the optimal form(s) and application method(s), and schedule implementation. As appropriate

Step 6: Monitor soil pH annually and maintain records. As appropriate

Action 8: Manage vegetation to minimize the potential for runoff to carry material off the ranges.

Step 1: Determine appropriate types of ground cover. Winter 2011

Step 2: Determine methods and schedule for shifting ground cover. Winter 2011

Step 3: Implement methods to shift the ground cover. Spring 2012

Step 4: Maintain ground cover on the ranges. As appropriate

Action 9: Manage and maintain settling areas as appropriate.

Step 1: Confirm that settling areas are appropriately located. Winter 2011

Step 2: Confirm that settling areas are designed and constructed consistent with regulations. Winter 2011

Step 3: Determine that the locations and sizes of the areas are appropriate. Winter 2011

Step 4: Confirm that the settling areas optimize accumulation of lead. Winter 2011

Step 5: Maintain the effectiveness of the settling areas. As appropriate

Step 6: Create access routes to settling areas to facilitate management. Summer 2012

Action 10: Protect and monitor groundwater quality through the existing monitoring wells.

Step 1: Take steps available to ESC to encourage the Town to secure the wells. Summer 2011

Step 2: Request the Town to share well monitoring data. Summer 2011

Action 11: Maintain lead-containing areas in vegetation unattractive to seed-eating birds.

Step 1: Determine vegetation to minimize attractiveness to seed-eating birds. Winter 2011

Step 2: Determine optimal methods and schedule for shifting vegetation. Winter 2011

Step 3: Implement the selected methods to shift the vegetation. Spring 2012

Step 4: Maintain the desired vegetation. As appropriate

Action 12: Collect and manage cases and hulls as warranted.

Step 1: Determine methods of collecting cases and hulls. Winter 2011

Step 2: Collect cartridge cases and hulls as warranted. Winter 2011

Step 3: Dispose or recycle cartridges and hulls. Winter 2011

Step 4: If warranted, begin recycling hulls. As appropriate

Action 13: Collect and manage wads as warranted.

Step 1: Determine method of colleting wads. Winter 2011

Step 2: Collect wads as warranted. Winter 2011

Step 3: Investigate recycling wads. Winter 2011

Step 4: If warranted, begin recycling wads or dispose properly. As appropriate

Action 14: Collect and manage asphalt pitch target fragments as warranted.

Step 1: Determine method of colleting target fragments. Summer 2012

Step 2: Collect target fragments as warranted. As appropriate

Step 3: Investigate recycling target fragments. Summer 2012

Step 4: If practical, determine quantity of target fragments required for practical recycling. As appropriate

Step 5: If warranted, begin recycling target fragments or dispose properly. As appropriate

Step 6: Re-establish vegetative ground cover as appropriate. As appropriate

Action 15: Remain current on advances in biodegradable clay targets.

Step 1: Investigate advances in biodegradable targets relative to performance issues. Summer 2012

Step 2: If warranted, evaluate use of biodegradable targets. Autumn 2012

Step 3: If warranted, institute exclusive use of biodegradable targets. Autumn 2012

Step 4: Determine the pH of the deposits of degraded target residue. Winter 2012, Spring 2013, and as appropriate

Step 5: Maintain the pH of deposits of target residue between 6.5 and 8.5. Winter 2012, Spring 2013, and as appropriate

Step 6: Add organic matter and nutrients to obtain satisfactory plant growth. Winter 2012, Spring 2013, and as appropriate

Step 7: Maintain the desired vegetation on the deposits of target residue. As appropriate

Action 16: Annually review ESP implementation and revise as appropriate.

Step 1: Assign a person overall responsibility for the ESP. Summer 2011

Step 2: At least annually evaluate and revise the ESP as appropriate. Summer 2012

Step 3: Prepare updated ESP for the coming year. Summer 2012

Summary of Schedule of Actions to Implement ESP

Action	Summer 2011	Autumn 2011	Winter 2011	Spring 2012	Summer 2012	Autumn 2012	Winter 2012	Spring 2013	As Appropriate
Action 1									
Step 1	X								
Step 2	X								
Step 3	X								
Step 4	X								
Step 5	X								
Action 2									
Step 1	X								
Step 2	X								
Step 3		X							
Step 4			X						
Step 5				X					
Step 6					X				
Action 3									
Step 1	X								
Step 2	X								
Step 3		X							
Step 4		X							
Step 5			X						
Step 6									X
Step 7									X
Action 4									
Step 1	X								
Step 2	X								
Step 3		X							
Step 4		X							
Step 5		X							
Step 6			X						
Action 5									
Step 1	X								
Step 2			X						
Step 3			X						
Step 4									X
Step 5									X
Step 6									X
Action 6									
Step 1	X								
Step 2									X
Step 3									X
Action 7									
Step 1	X								
Step 2		X							
Step 3		X							
Step 4			X						
Step 5									X
Step 6									X

Action	Summer 2011	Autumn 2011	Winter 2011	Spring 2012	Summer 2012	Autumn 2012	Winter 2012	Spring 2013	As Appropriate
Action 8									
Step 1			X						
Step 2			X						
Step 3				X					
Step 4									X
Action 9									
Step 1			X						
Step 2			X						
Step 3			X						
Step 4			X						
Step 5									X
Step 6					X				
Action 10									
Step 1	X								
Step 2	X								
Action 11									
Step 1			X						
Step 2			X						
Step 3				X					
Step 4									X
Action 12									
Step 1			X						
Step 2			X						
Step 3			X						
Step 4									X
Action 13									
Step 1			X						
Step 2			X						
Step 3			X						
Step 4									X
Action 14									
Step 1					X				
Step 2									X
Step 3					X				
Step 4									X
Step 5									X
Step 6									X
Action 15									
Step 1					X				
Step 2						X			
Step 3						X			
Step 4							X	X	X
Step 5							X	X	X
Step 6							X	X	X
Step 7									X
Action 16									
Step 1	X								
Step 2					X				
Step 3					X				

Appendix D

Responsibility for Actions to Implement Environmental Stewardship Plan

Responsibility for Actions to Implement Environmental Stewardship Plan For Exeter Sportsman's Club

The following assignment of responsibilities for actions to implement the ESP is considered appropriate at the time of development of the ESP. Implementation experience or unforeseen circumstances may warrant modifications to the responsibilities indicated below. The actions are summarized here from their full descriptions in Section 3.2; activities should be based on the full descriptions in the text rather than these summaries. The responsibilities are presented in both text and tabular format.

Action 1: Confirm that the rifle range backstops, side berms, and baffles are consistent with NRA guidance. Range Captain

Action 2: Confirm that shot is confined to the trap field. Field Captain and Environmental Stewardship Captain

Action 3: Reclaim and recycle bullets from the rifle/pistol range. Range Captain

Action 4: Maximize the practicality of reclaiming shot from the trap field. Field Captain and Environmental Stewardship Captain

Action 5: Reclaim and recycle shot from the trap field. Field Captain

Action 6: Remain current on advances in non-lead shot, and re-evaluate its use as warranted. Field Captain and Environmental Stewardship Captain

Action 7: Periodically monitor and adjust surficial soil pH. Environmental Stewardship Captain

Action 8: Manage vegetation to minimize the potential for runoff to carry material off the ranges. Range Captain, Field Captain, and Facilities Captain

Action 9: Construct settling areas as appropriate. Range Captain, Field Captain, and Facilities Captain

Action 10: Protect and monitor groundwater quality through the existing monitoring wells. Facilities Captain and Environmental Stewardship Captain

Action 11: Maintain lead-containing areas in vegetation unattractive to seed-eating birds. Field Captain

Action 11: Collect and manage cases and hulls as warranted. Field Captain

Action 13: Collect and manage wads as warranted. Field Captain

Action 14: Collect and manage asphalt pitch target fragments as warranted. Field Captain

Action 15: Remain current on advances in biodegradable clay targets. Field Captain and Environmental Stewardship Captain

Action 16: Annually review ESP implementation and revise as appropriate. President and Environmental Stewardship Captain

Summary of Responsibilities for Actions to Implement ESP

Action	Responsible PSA personnel Position or Individual
Action 1	Range Captain
Action 2	Field Captain and Environmental Stewardship Captain
Action 3	Field Captain and Environmental Stewardship Captain
Action 4	Range Captain
Action 5	Field Captain
Action 6	Field Captain and Environmental Stewardship Captain
Action 7	Environmental Stewardship Captain
Action 8	Range Captain, Field Captain and Facilities Captain
Action 9	Range Captain, Field Captain and Facilities Captain
Action 10	Facilities Captain and Environmental Stewardship Captain
Action 11	Field Captain
Action 12	Field Captain
Action 13	Field Captain
Action 14	Field Captain
Action 15	Field Captain and Environmental Stewardship Captain
Action 16	President and Environmental Stewardship Captain